# Studies on the Propionibacterium. (III)

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# 40. Studies on the Propionibacterium. (III)

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Succinic acid has been recognized as a fermentation product of propionic acid bacteria. The present experiments were carried out to determine conditions on the production of succinic acid. For the strains of the baoteria, P. arabinosum (11N2) and P. zeae (3A41), which were isolated from cow milk by us (See this Bulletin vol. 24, Marce 31, 1951), were used. For cultural media, 1% glucose or arabinose for substrate and yeast water containing 1% pepton for source of nitrogen were used. In some fermentations sterile $CaCO_3$ was added immediately before the inoculation, and other cases, sterile NaOH solution was added periodically as much as required. All flasks were incubated anaerobically at 30°C, for 7 days. No remarkable difference in the production of succinic acid was verified among the various experimental conditions mentioned above. Thus succinic acid is suggested not to be a final product of fermentation but it might be a component constituting the dehydrogenation system brought about by the bacteria.

The course of the decomposition of succinic acid by the bacteria 11N2, with the media containing a small amount of sugars, as it will be seen in the following Table would be expressed by the equation;

$$COOH \cdot CH_2 \cdot CH_2 \cdot COOH \longrightarrow CH_3CH_2 \cdot COOH + CO_2$$

as was suggested by Delwiche (J. of Bact. **56** 811 (1948)).

| No. of experiments | | No. 1 | No. 2 | No. 3 |
|---|---|---|---|---|
| Substrate added (mg/100 cc) | Succinic acid | 718 | 718 | 0 |
| | Glucose | 208 | 0 | 0 |
| | Alabinose | 0 | 201 | 201 |
| Succinic acid remained (mg/100 cc) | | 15 | 19 | — |
| Propionic acid produced ( 〃 ) | | 620 | 534 | 96.9 |
| Acetic acid Produced ( 〃 ) | | 72.0 | 71.4 | 71.1 |
| $CO_2$ produbed ( 〃 ) | | 338 | 305 | |

Therefore, the production of propionic acid by the bacteria may greatly due to the decarboxylation of succenic acid as is suggested in the equation, than to the reduction of lactic acid.